

Draft Domestic U.S. RVSM Operational Policy/Procedures (Feb 27, 2004)

Explanation. This material provides “near-final” draft operational policy and procedures for Domestic U.S. RVSM (DRVSM) operations. It is being coordinated with Canada and Mexico with the intent of harmonizing policy/procedures to the extent possible. The FAA has received comment on the material from FAA organizations and from industry. The FAA is progressing the formal review process and plans to publish the final DRVSM policy/procedures in **May 2004**. The document will be distributed to FAA organizations and industry and posted on the DRVSM and RVSM Documentation Webpages. In addition, the Flight Technologies and Procedures Divisions (AFS-400) will develop a Sample Pilot Bulletin. The material will be published in the Aeronautical Information Manual (AIM) in **early 2005**.

Offshore Airspace. Additional operator guidance will be provided, as necessary, for RVSM operations in Gulf of Mexico and Atlantic High Offshore Airspace. The goal is to post that material on the RVSM Documentation Webpage in the May 2004 timeframe. It will be posted under “Area of Operations Specific Information and Operational Policy/Procedures”.

Draft AIM DRVSM Table of Contents.

- 4-5-1 Applicability and RVSM Mandate: Date/Time and Area
- 4-5-2 Flight Level Orientation Scheme
- 4-5-3 Aircraft and Operator Approval Policy/Procedures,
Monitoring and Approvals Databases
- 4-5-4 Flight Planning Into DRVSM Airspace
- 4-5-5 Pilot RVSM Operating Practices and Procedures
- 4-5-6 Guidance on Mountain Wave Activity (MWA) and Severe
Turbulence
- 4-5-7 Guidance on Wake Turbulence
- 4-5-8 Pilot/Controller Phraseology
- 4-5-9 Contingency Actions: Weather Encounters and Aircraft
System Failures
- 4-5-10 Procedures for Accommodation of Non-RVSM Civil Aircraft
Conducting Lifeguard and Certification/Development Flights
- 4-5-11 Non-RVSM Aircraft Requesting Climb To and Descent From Flight
Levels Above RVSM Airspace

Draft AIM Chapter 4 (Air Traffic Control), Section 5 (Domestic U.S. Reduced Vertical Separation Minimum (DRVSM))

4-5-1. APPLICABILITY AND RVSM MANDATE (DATE/TIME AND AREA)

a. Applicability. The policies, guidance and direction in this section apply to RVSM operations in the airspace over the lower 48 states, Alaska and in offshore airspace where direct controller/pilot communications (DCPC) and radar surveillance are normally available. Policies, guidance and direction for RVSM operations in oceanic airspace and offshore airspace where DCPC and radar surveillance are not available and the airspace of other countries can be found on the FAA “RVSM Documentation” Webpage described in paragraph 4-5-3.

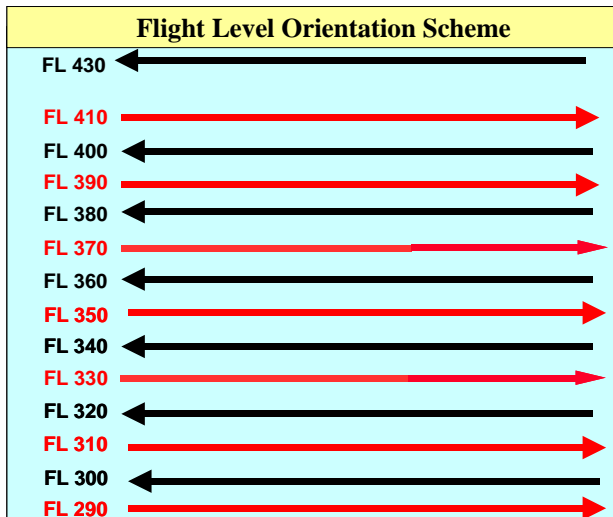
b. Mandate. At 0901 UTC on January 20, 2005, the FAA will implement RVSM between flight level (FL) 290-410 (inclusive) in the following airspace: the airspace of the lower 48 states of the United States, Alaska, Atlantic and Gulf of Mexico High Offshore Airspace and the San Juan FIR. (A chart showing the location of Offshore airspace is posted on the RVSM Documentation Webpage). RVSM will also be introduced into the adjoining airspace of Canada and Mexico to provide a seamless environment for aircraft traversing those borders.

c. RVSM Authorization. In accordance with Title 14 of the Code of Federal Regulations (14 CFR) Section 91.180, with only limited exceptions, prior to operating in RVSM airspace, operators and aircraft must have received RVSM authorization from the responsible civil aviation authority. (See paragraph 4-5-3). If the operator or aircraft or both have not been authorized for RVSM operations, the aircraft will be referred to as a “Non-RVSM” aircraft. Paragraph 4-5-10 provides ATC policies for accommodation of Non-RVSM aircraft flown by the Department of Defense, Air Ambulance (Lifeguard) operators and aircraft flown for certification and development. Paragraph 4-5-11 contains policies for Non-RVSM aircraft climbing to and descending from FL 430 or above.

d. Benefits. DRVSM will enhance ATC flexibility, mitigate conflict points, enhance sector throughput, reduce controller workload and enable crossing traffic. Operators will gain fuel savings and operating efficiency benefits by flying at more fuel efficient flight levels and on more user preferred routings.

4-5-2. FLIGHT LEVEL ORIENTATION SCHEME

a. Altitude assignments for direction of flight will follow the odd altitude assignment for magnetic courses 000-179 degrees and even altitudes for magnetic courses 180-359 degrees for flights up to and including FL410 as indicated in the chart below.



RVSM Note:

Odd Flight Levels: Magnetic Course 000-179 Degrees

Even Flight Levels: Magnetic Course 180-359 Degrees

4-5-3. AIRCRAFT AND OPERATOR APPROVAL POLICY/PROCEDURES, MONITORING AND APPROVALS DATABASES

a. RVSM Authority. 14 CFR Section 91.180 applies to RVSM operations within the U.S. Section 91.706 applies to RVSM operations outside the U.S. Both sections require that the operator obtain authorization prior to operating in RVSM airspace. Section 91.180 requires that, prior to conducting RVSM operations within the U.S., the operator obtain authorization from the FAA or from the country of registry, as appropriate. In addition, it requires that the operator and the operator's aircraft comply with the standards of part 91 Appendix G (Operations in RVSM Airspace).

b. Sources Of Information. The FAA RVSM Website Homepage can be accessed at: www.faa.gov/ats/ato/rvsm1.htm. The "RVSM Documentation" and "Domestic RVSM" webpages are linked to the RVSM Homepage. "RVSM Documentation" contains guidance and direction for an operator to obtain aircraft and operator approval to conduct RVSM operations within the U.S. It also provides that information for oceanic and international RVSM airspace. It is recommended that operators planning to operate in Domestic U.S. RVSM airspace first review the following documents to orient themselves to the approval process.

1. Under "Area of Operations Specific Information", the document, "Basic Operator Information on DRVSM Programs", provides an overview of the DRVSM program and the related aircraft and operator approval programs.

2. In the “Getting Started” section, review the “RVSM Approval Checklist – US Operators” or “RVSM Approval Checklist – Non-US Operators” (as applicable). These are job aids or check lists that show aircraft/operator approval process events with references to related RVSM documents published on the website.

3. Under “Documents Applicable to All RVSM Approvals”, review “RVSM Area New to the Operator”. This document provides a guide for operators that are conducting RVSM operations in one or more areas of operation, but are planning to conduct RVSM operations in an area where they have not previously conducted RVSM operations, such as the U.S.

c. TCAS Equipage. TCAS equipage requirements are contained in 14 CFR sections 121.356, 125.224, 129.18 and 135.189. Part 91 Appendix G does not contain TCAS equipage requirements specific to RVSM, however, Appendix G does require that aircraft equipped with TCAS II and flown in RVSM airspace be modified to incorporate TCAS II Version 7.0 or a later version.

d. Aircraft Monitoring. Operators are required to participate in the RVSM aircraft monitoring program. The “Monitoring Requirements and Procedures” section of the RVSM Documentation Webpage contains policies and procedures for participation in the monitoring program. Ground-based and GPS-based monitoring systems are available for the Domestic RVSM program. Monitoring is a quality control program that enables the FAA and other civil aviation authorities to assess the in-service altitude-keeping performance of aircraft and operators.

e. Registration On RVSM Approvals Databases. The “Registration on RVSM Approvals Database” section of the RVSM Documentation Webpage provides policies/procedures for operator and aircraft registration on RVSM approvals databases.

1. Purpose of RVSM Approvals Databases. ATC does not use RVSM approvals databases to determine whether or not a clearance can be issued into RVSM airspace. RVSM program managers do regularly review the operators and aircraft that operate in RVSM airspace to identify and investigate those aircraft and operators flying in RVSM airspace, but not listed on the RVSM approvals databases.

2. Registration of U.S. Operators. When U.S. operators and aircraft are granted RVSM authority, the FAA Flight Standards office will make an input to the FAA Program Tracking and Reporting Subsystem (PTRS). The Separation Standards Group at the FAA Technical Center obtains PTRS operator and aircraft information to update the FAA maintained U.S. Operator/Aircraft RVSM Approvals Database. Basic database operator and aircraft information can be viewed on the RVSM Documentation Webpage by clicking on the appropriate database icon.

3. Registration of Non-U.S. Operators. Non-U.S. operators can find policy/procedures for registration on the North American Approvals Registry and Monitoring Organization (NAARMO) database in the “Registration on RVSM Approvals Database” section of RVSM Documentation.

4-5-4. FLIGHT PLANNING INTO DRVSM AIRSPACE

a. The operator uses the equipment block of the FAA Flight Plan (FAA Form 7233-1) or the ICAO Flight Plan to inform ATC whether or not the operator has received authorization to fly the aircraft in RVSM airspace. (Block 3 on the FAA Flight Plan is “Aircraft Type/Special Equipment”). ATC will use the equipment block information to either issue or deny clearance into RVSM airspace and to apply either a 1,000 or 2,000 foot vertical separation minimum. (See

paragraphs 4-5-10 and 4-5-11 for policy on limited operation of unapproved aircraft in RVSM airspace).

b. On the FAA Flight Plan, if the aircraft has Advanced RNAV capability (/E, /F, /G or /R capability per the Aircraft Equipment Suffixes table in Chapter 5), the letter “Q” will be filed to indicate both RVSM authority and /E, /F, /G or /R capability to conduct terminal and enroute RNAV procedures. If the aircraft does not have Advanced RNAV capability, then the letter “W” will be filed to indicate RVSM authority.

c. On the ICAO Flight Plan, the operator will file letter “W” to indicate that it has been granted RVSM authorization and the appropriate ICAO Flight Plan suffixes to indicate RNAV capability.

d. Since the equipment suffixes may change, the operator should check the “Aircraft Equipment Suffixes” table in Chapter 5, Section 1 (Preflight) for the current equipment suffix to file in FAA Flight Plans.

e. In accordance with 14 CFR Part 91 Appendix G, Section 4, the operator will not annotate the equipment block of the ATC flight plan with the letter indicating RVSM authorization unless the responsible civil aviation authority has determined that both the operator and its aircraft are RVSM-compliant and has issued RVSM authorization to the operator.

4-5-5. PILOT RVSM OPERATING PRACTICES AND PROCEDURES

a. RVSM Mandate. If either the operator or the aircraft or both have not received RVSM authorization (Non-RVSM aircraft), the pilot will neither request nor accept a clearance into RVSM airspace unless:

1. The pilot intends to climb to or descend from FL 430 or above in accordance with paragraph 4-5-11.
2. The flight is conducted by a Non-RVSM DoD, Lifeguard or certification/development aircraft in accordance with paragraph 4-5-10.
3. An emergency situation exists.

b. Basic RVSM Operating Practices And Procedures. Appendix 4 of Interim Guidance 91-RVSM contains pilot practices and procedures for RVSM. Operators must incorporate Appendix 4 practices and procedures, as supplemented by applicable AIM paragraphs, into operator training or pilot knowledge programs and operator documents containing RVSM operational policies. Interim Guidance 91-RVSM is published on the RVSM Documentation Webpage under “Documents Applicable to All RVSM Approvals”.

c. Appendix 4 contains practices and procedures for flight planning, preflight procedures at the aircraft, procedures prior to RVSM airspace entry, in-flight (enroute) procedures, contingency procedures and post flight.

d. The AIM paragraphs below either clarify or supplement Appendix 4 practices and procedures.

4-5-6. Guidance on Mountain Wave Activity (MWA) and Severe Turbulence

a. Introduction/Explanation

1. MWA is a weather phenomenon that is known to ATC and operators. Practices for MWA have been and are being applied. The information in this paragraph is being provided to emphasize to pilots and controllers the importance of taking appropriate action in RVSM airspace when aircraft experience MWA that is of sufficient magnitude to significantly affect altitude-keeping.

2. Significant MWA also occurs frequently below FL 290, the floor of RVSM airspace. MWA is generally experienced in the months between late fall and early spring. It often occurs in western states in the vicinity of mountain ranges. It may occur when strong winds blow perpendicular to mountain ranges resulting in up and down or wave motions in the atmosphere. Wave action can produce altitude excursions and airspeed fluctuations accompanied by only light turbulence. With sufficient amplitude, however, wave action can induce altitude and airspeed fluctuations accompanied by severe turbulence. MWA is difficult to forecast and can be highly localized and short lived.

3. Wave activity is not necessarily limited to the vicinity of mountain ranges. Pilots experiencing wave activity anywhere that significantly affects altitude-keeping can follow the guidance provided below.

4. Severe turbulence causes large, abrupt changes in altitude and/or attitude usually accompanied by large variations in indicated airspeed. Aircraft may be momentarily out of control. Encounters with severe turbulence must be remedied immediately in any phase of flight.

5. For both MWA and severe turbulence encounters in RVSM airspace, an additional concern is the sensitivity of collision avoidance systems when one or both aircraft operating in close proximity receive TCAS advisories in response to disruptions in altitude hold capability.

6. As described in paragraph d below, “merging target procedures” are ATC procedures that serve as the basis for mitigation of both MWA and severe turbulence. During normal operations, merging target procedures call for en route controllers to advise pilots of potential traffic that they perceive may fly directly above or below his/her aircraft at minimum vertical separation. In response, pilots may request a radar vector to insure their radar target will not merge or overlap with the traffic’s radar target.

REFERENCE: FAAO 7110.65, Merging Target Procedures, Para 5-1-8

b. Pre-flight tools

Sources of observed and forecast information that can help the pilot ascertain the possibility of MWA or severe turbulence are: Forecast Winds and Temperatures Aloft (FD), Area Forecast (FA), SIGMETs and PIREPS.

c. In-flight MWA Indicators

Indicators that the aircraft is being subjected to MWA are:

1. Altitude excursions and airspeed fluctuations with or without associated turbulence
2. Pitch and trim changes required to maintain altitude with accompanying airspeed fluctuations.
3. Light to Severe Turbulence depending on the magnitude of the MWA.

d. Pilot Actions When Experiencing MWA or Severe Turbulence.

1. When pilots encounter severe turbulence, they should contact ATC, report the situation and advise what assistance he/she desires. In addition, until the pilot reports clear of severe turbulence, the controller will apply merging target vectors to one or both aircraft to prevent their targets from merging:

Pilot: Yankee 123, FL310, experiencing severe turbulence.

Controller: Yankee 123, fly heading 290, traffic twelve o'clock, 10 miles, opposite direction; eastbound MD-80 at FL 320; *(or the controller may issue a vector to the traffic to avoid Yankee 123)*

2. When pilots encounter MWA, they should contact ATC and report experiencing MWA to inform ATC of the magnitude and location of the wave activity. When a controller makes a merging targets traffic call, the pilot may request a vector to avoid flying directly over or under the traffic:

Pilot: Yankee 123 request vector to avoid traffic.

Controller: Yankee 123, fly heading 290.

3. To leave airspace where MWA or severe turbulence is being encountered, the pilot may request a FL change and/or reroute, if necessary.

4-5-7. GUIDANCE ON WAKE TURBULENCE

a. Pilots should be aware of the potential for wake turbulence encounters following DRVSM implementation. Experience gained since 1997, however, has shown that such encounters in RVSM airspace are generally moderate or less in magnitude.

b. It is anticipated that, in DRVSM airspace, wake turbulence experience will mirror European RVSM experience gained since January 2002. European authorities have found that reports of wake turbulence encounters had not increased significantly since RVSM implementation (eight versus seven reports in a ten month period). In addition, they found that reported wake turbulence was generally similar to moderate clear air turbulence.

c. Pilot Action.

1. Pilots should be alert for wake turbulence when operating:

- (a) In the vicinity of aircraft climbing or descending through their altitude.
- (b) Approximately 12-15 miles after passing 1,000 feet below opposite-direction traffic.
- (c) Approximately 12-15 miles behind and 1,000 below same-direction traffic.

2. Pilots encountering or anticipating wake turbulence in DRVSM airspace have the option of requesting a vector, FL change or if capable, a lateral offset.

NOTE-

Offsets of approximately a wing span upwind generally can move the aircraft out of the immediate vicinity of another aircraft's wake vortex.

d. The FAA will track wake turbulence events as an element of its post implementation program. The FAA will advertise wake turbulence reporting procedures to the operator community and publish reporting procedures on the RVSM Documentation Webpage (See address in paragraph 4-5-3b).

4-5-8. PILOT/CONTROLLER PHRASEOLOGY

Figure 4-5-1 shows standard phraseology that pilots and controllers will use to communicate in DRVSM operations.

FIG 4-5-1.

Standard Phraseology for DRVSM Operations

Message	Phraseology
For a controller to ascertain the RVSM approval status of an aircraft:	(call sign) confirm RVSM approved
Pilot indication that flight is RVSM approved	Affirm RVSM
Pilot will report lack of RVSM approval (Non-RVSM status): a. On the initial call on any frequency in the RVSM airspace and... b. In all requests for flight level changes pertaining to flight levels within the RVSM airspace and... c. In all read-backs to flight level clearances pertaining to flight levels within the RVSM airspace and... d. In read back of flight level clearances involving climb and descent through RVSM airspace (FL290-410)	Negative RVSM, (supplementary information, e.g., "Certification flight").
Pilot report one of the following after entry into RVSM airspace: all primary altimeters, auto-pilot or altitude alerters have failed. (See paragraph 4-5-9). <i>(This phrase is to be used to convey both the initial indication of RVSM aircraft system failure and on initial contact on all frequencies in RVSM airspace until the problem ceases to exist or the aircraft has exited RVSM airspace).</i>	Unable RVSM Due Equipment
ATC denial of clearance into RVSM airspace	Unable issue clearance into RVSM airspace, maintain (or descend to or climb to) FL
Pilot reporting severe turbulence affecting ability to maintain level. (See paragraph 4-5-9).	Unable RVSM due turbulence
ATC requesting pilot to confirm that an aircraft has regained RVSM-approved status or a pilot is ready to resume RVSM	Confirm able to resume RVSM
Pilot ready to resume RVSM after aircraft system or weather contingency	Ready to resume RVSM

4-5-9. CONTINGENCY ACTIONS: WEATHER ENCOUNTERS AND AIRCRAFT SYSTEM FAILURES

Figure 4-5-2 provides pilot guidance on actions to take under certain conditions of aircraft system failure and weather encounters. It also describes the expected ATC controller actions in these situations. It is recognized that the pilot and controller will use judgment to determine the action most appropriate to any given situation.

FIG 4-5-2.
Contingency Actions: Weather Encounters and Aircraft System Failures

Initial Pilot Actions in Contingency Situations

Initial Pilot Actions when unable to maintain flight level (FL) or unsure of aircraft altitude-keeping capability:

- Notify ATC and request assistance as detailed below.
- Maintain cleared flight level, to the extent possible, while evaluating the situation
- Watch for conflicting traffic both visually and by reference to TCAS, if equipped
- Alert nearby aircraft by illuminating exterior lights (commensurate with aircraft limitations)

Severe Turbulence

Pilot will: <ul style="list-style-type: none">• Contact ATC and state “Unable RVSM Due Turbulence”• Request vector clear of traffic at adjacent FL’s• Request FL change or re-route, if desired	Controller will: <ul style="list-style-type: none">• Advise pilot of conflicting traffic• Provide lateral or longitudinal separation from aircraft at adjacent FL’s, traffic permitting• Issue FL change or re-route, traffic permitting
--	---

Mountain Wave Activity (MWA)

Pilot actions: <ul style="list-style-type: none">• Contact ATC and report experiencing MWA• If controller calls approaching or converging traffic at adjacent FL and the aircraft is experiencing MWA that significantly affects altitude-keeping, pilot may request vector for traffic avoidance• If so desired, request a FL change or re-route• Report location and magnitude of MWA to ATC <p>See paragraph 4-5-6 for guidance on MWA.</p>	Controller actions: <ul style="list-style-type: none">• Advise pilot of conflicting traffic at adjacent FL• If pilot requests, vector aircraft to avoid merging target with traffic at adjacent RVSM flight levels, traffic permitting• Issue FL change or re-route, traffic permitting• Issue PIREP to other aircraft
---	--

Wake Turbulence Encounters

Pilot should: <ul style="list-style-type: none">• Contact ATC and request vector, FL change or, if capable, a lateral offset See paragraph 4-5-7 for guidance on wake turbulence.	Controller should: <ul style="list-style-type: none">• Issue vector, FL change or lateral offset clearance, traffic permitting
---	---

Failure of Auto-pilot, Altitude Alerter or All Primary Altimeters.

Pilot will: <ul style="list-style-type: none">• Contact ATC and state “Unable RVSM Due Equipment”• Request clearance out of RVSM airspace unless operational situation dictates otherwise	Controller will: <ul style="list-style-type: none">• Provide 2,000 ft. vertical separation or appropriate horizontal separation• Clear aircraft out of RVSM airspace unless operational situation dictates otherwise
---	--

One Primary Altimeter Remains Operational.

Pilot will: <ul style="list-style-type: none">• Cross check stand-by altimeter• Notify ATC of operation with single primary altimeter• If unable to confirm primary altimeter accuracy, follow actions for failure of all primary altimeters	Controller will: <ul style="list-style-type: none">• Acknowledge operation with single primary altimeter
---	---

4-5-10. PROCEDURES FOR ACCOMMODATION OF NON-RVSM CIVIL AIRCRAFT CONDUCTING LIFEGUARD AND CERTIFICATION/DEVELOPMENT FLIGHTS)

a. The RVSM mandate calls for only RVSM authorized aircraft/operators to fly in designated RVSM airspace with limited exceptions. The policies detailed below are intended exclusively for use by civil aircraft conducting Lifeguard and Certification/Development flights that the FAA has agreed to accommodate. They are not intended to provide other operators a means to circumvent the normal RVSM approval process.

Note: policies for Non-RVSM DoD and Non-United States State aircraft will be published in other appropriate FAA documents.

b. If either the operator or aircraft or both have not been authorized to conduct RVSM operations, the aircraft will be referred to as a “Non-RVSM” aircraft. 14 CFR 91.180 and part 91 Appendix G enable the FAA to authorize a deviation to operate a Non-RVSM aircraft in RVSM airspace. This paragraph and paragraph 4-5-11 establish the conditions under which the FAA will exercise this authority.

c. Lifeguard and aircraft operated for certification and development purposes will be handled on a workload permitting basis. The vertical separation standard applied between aircraft not approved for RVSM and all other aircraft shall be 2,000 feet.

d. Regular Non-RVSM Operations. Operators of aircraft flown for certification/development purposes that regularly conduct Non-RVSM flights in an area will develop procedures for the operation of Non-RVSM aircraft with the local ARTCC's wherein the flights operate.

e. Individual Flights In a Center's Airspace. Operators of Non-RVSM Lifeguard and certification/development flight aircraft should contact the Operations Manager of the ARTCC within which the flight will operate to coordinate flight in RVSM airspace.

f. Flights Involving Multiple ARTCC's. Should the needs of the flight involve more than one or include several ARTCCs, the operator should contact the ATC System Command Center (ATCSCC) for assistance with the coordination process.

g. The pilot of Non-RVSM aircraft will inform the controller of the lack of RVSM approval in accordance with the direction provided in paragraph 4-5-8.

4-5-11. NON-RVSM AIRCRAFT REQUESTING CLIMB TO AND DESCENT FROM FLIGHT LEVELS ABOVE RVSM AIRSPACE

a. Non-RVSM aircraft requesting climb to and descent from flight levels above RVSM airspace will be handled on a workload permitting basis. The vertical separation standard applied in RVSM airspace between Non-RVSM aircraft and all other aircraft shall be 2,000 feet.

b. Non-RVSM aircraft requesting climb/descent through RVSM airspace can only be considered for accommodation provided:

1. Aircraft is capable of a continuous climb/descent and does not need to level off at an intermediate altitude for any operational considerations and.

2. Aircraft is capable of climb/descent at the normal rate for the aircraft.

c. The pilot of Non-RVSM aircraft will inform the controller of the lack of RVSM approval in accordance with the direction provided in paragraph 4-5-8.